

L-5500

Broadband Cellular Router



Table of Contents

1.	PREFACE.....	1
1.1.	Copyright Notice	1
1.2.	Modem Use	1
1.3.	Interference Issues	1
1.4.	FCC Notification	2
2.	PRODUCT OVERVIEW	3
2.1.	Device Identification	3
2.1.1.	Label Information.....	3
2.2.	General Description	3
2.3.	Features	3
2.4.	External Interfaces	4
2.4.1.	Front Panel Connections	4
2.4.2.	LEDs	5
2.4.3.	Back Panel Connections.....	5
2.5.	RJ-45 Ethernet Ports.....	6
2.6.	Power Cable Connections	6
2.7.	Antenna Options	7
2.7.1.	Primary Cellular Antenna	7
2.7.2.	RX Diversity Cellular Antenna.....	7
2.7.3.	GPS Antenna	7
2.7.4.	WiFi Antenna	7
2.7.5.	Antenna Spacing	7
3.	Networking Basics	10
3.1.	General Networking Definitions	10
4.	Getting Started.....	12
4.1.	Package Contents.....	12
4.2.	Setup Requirements	12
4.3.	Quick Start.....	12
4.3.1.	Hardware Setup	12
4.3.2.	Configuring Local PC	13
4.3.3.	L-5500 Radio Modem Setup	13
4.4.	Provisioning the L-5500 Radio Modem	14
4.4.1.	Provisioning with Verizon Wireless	15
4.4.2.	Provisioning with Sprint.....	16
5.	L-5500 Configuration	18
5.1.	General Instructions	18
5.2.	Home Page Parameters	18
5.2.1.	Home Page Parameter Descriptions.....	19
5.3.	Cellular WAN Parameters.....	21
5.3.1.	Status	21
5.3.2.	Activation.....	22
5.3.3.	Dial Settings.....	22
5.3.4.	Mobile IP Settings	24
5.4.	LAN Settings	26
5.4.1.	IP Settings	26
5.5.	WiFi (WLAN).....	28

5.5.1. WiFi (WLAN) - Main	28
5.5.2. WiFi (WLAN) - Wireless Settings (Client).....	29
5.5.3. WiFi (WLAN) – Wireless Settings (Access Point).....	31
5.5.4. WiFi (WLAN) – Stats	32
5.5.5. WiFi (WLAN) – Site Survey	33
5.6. Router Settings.....	33
5.6.1. Static Routes	33
5.6.2. Routing Table	34
5.7. Advanced Settings.....	35
5.7.1. Advanced Settings – NAT and Port Forwarding (Mapping).....	35
5.7.2. Advanced Settings – Dynamic DNS (NO-IP Configuration)	36
5.7.3. Advanced Settings – IP Filter	38
5.7.4. Advanced Settings – IPsec.....	41
5.7.5. Advanced Settings – Remote Admin	43
5.7.6. Advanced Settings – Power Management.....	43
5.8. SNMP	44
5.9. GPS	45
5.9.1. GPS Status.....	45
5.9.2. AAVL Settings (Local and Remote Delivery).....	46
5.9.3. Sensor Reporting	48
5.10. Serial Port Settings.....	50
5.10.1. Serial Port	50
5.11. I/O Settings	52
5.11.1. I/O Signal Specifications	53
5.11.2. Debouncing	53
5.11.3. Inserting Wires Into I/O Port Connector	53
5.11.4. I/O Configuration.....	54
5.12. System Upgrade	55
5.12.1. Configuration File	55
6. Carrier Specific Information.....	56
6.1. Verizon Wireless	56
6.2. Bell Mobility.....	56
6.3. Sprint PCS	57
6.3.1. IOTA Provisioning.....	57
7. Service and Support	58
7.1. Product Warranty, RMA and Contact Information	58
7.2. RMA Request	58
7.3. Product Documentation	58
7.4. Technical Support	58
8. Appendix A – Road Safety Integration	59
8.1. Prerequisites	59
8.2. Configuration.....	59
8.2.1. Physical Connection	59
8.2.2. L-5500 Serial Port Configuration.....	60
8.2.3. Road Safety Base Station Configuration.....	60

1. PREFACE

1.1. Copyright Notice

©2012 to 2013 Logic Data Systems LLC. All Rights Reserved.

This manual covers the operation of the Logic Data Systems L-5500 CDMA Cellular Modem. Specifications described are typical only and are subject to normal manufacturing and service tolerances.

Logic Data Systems LLC reserves the right to modify the equipment, its specifications or this manual without prior notice, in the interest of improving performance, reliability, or servicing. At the time of publication all data is correct for the operation of the equipment at the voltage and/or temperature referred to. Performance data indicates typical values related to the particular product.

No part of this documentation or information supplied may be divulged to any third party without the express written consent of Logic Data Systems LLC.

Products offered may contain software which is proprietary to Logic Data Systems LLC or partner companies. The offer or supply of these products and services does not include or infer any transfer of ownership.

1.2. Modem Use

The Logic Data Systems L-5500 cellular modem is designed and intended for use in fixed, nomadic, or mobile applications. "Fixed" assumes the device is physically secured at one location and not easily moved to another location. "Mobile" assumes the modem is physically secured in a vehicle and is operated when the vehicle is moving. "Nomadic" assumes the modem is installed in a vehicle but is operated when the vehicle is stationary.

Please keep the cellular antenna of the L-5500 radio modem at a safe distance from your head and body while the modem is in use (see below).

Caution: Maintain a distance of at least 20 cm (8 inches) between the transmitter antennas and any person while in use. This modem is designed for use in applications that observe the 20 cm separation distance.

1.3. Interference Issues

Avoid possible radio frequency (RF) interference by following these guidelines:

- The use of cellular telephones or devices in aircraft is illegal. Use in aircraft may endanger operation and disrupt the cellular network. Failure to observe this restriction may result in suspension or denial of cellular services to the offender, legal action or both.

Do not operate in the vicinity of gasoline or diesel-fuel pumps unless use has been approved and authorized.

Do not operate in locations where medical equipment that the device could interfere with may be in use.

Do not operate in fuel depots, chemical plants, or blasting areas unless use has been approved and authorized.

Use care if operating in the vicinity of protected personal medical devices, i.e., hearing aids and pacemakers.

Operation in the presence of other electronic equipment may cause interference if equipment is incorrectly protected. Follow recommendations for installation from equipment manufacturers.

1.4. FCC Notification

This device complies with part 15 of the FCC rules. Operation is subject to the following conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

2. PRODUCT OVERVIEW

2.1. Device Identification

2.1.1. Label Information

The label contains the part number, serial number, MAC ID, FCC ID and the IMEI numbers in both Hex and decimal format.

2.2. General Description

The L-5500 Modem from Logic Data Systems is the ideal solution for a wide range of Internet Access, Corporate Network and wireless IP connectivity requirements.

The L-5500 product features high-speed wireless wide-area-network access to IP networks over 3G cellular networks. The L-5500 cellular radio modem advanced router features full Ethernet routing, DHCP Server, and NAT support. The embedded GPS makes it an ideal fit for mobile applications requiring position information and Internet connectivity. The built-in 802.11 WiFi tether allows you to step away from your vehicle and remain connected at all time. Alternatively, the client mode forwards all traffic via the WiFi interface instead of the cellular interface.

2.3. Features

- Gobi 3000 Cellular Chipset (Swappable carrier images)
- Embedded Linux on ARM 9 processor
- Built-in DHCP server and NAT support
- Browser-based management
- Embedded GPS
- Local and remote configuration
- 10/100 Ethernet interface (2)
- WiFi IEEE 802.11b/g 2.4GHz
- Built-in WiFi access point
- RSSI indicator
- I/O capability

2.4. External Interfaces

2.4.1. Front Panel Connections



Figure 1 - L-5500 radio modem's front panel

The L-5500 radio modem's front panel connections include:

GPS: SMA female, GPS antenna connector. This input requires a **3.3V**, GPS antenna with an SMA connection. For best coverage, use an active GPS antenna with a gain of >25dBm.

PWR: **9-28 VDC**; the mating connector is a Molex 43025-0400 4 position connector.

LAN1 & LAN2: Input for standard or crossover Ethernet cable.

COM: Standard RS-232 port for debugging, Garmin FMI, and maintenance.

ANT: SMA female, primary antenna connection. See section “Antenna options” for more information.

DIV: SMA female, receive diversity antenna. See section “Antenna options” for more information.

WiFi: RP-SMA jack, WiFi antenna. See section “Antenna options” for more information.

2.4.2. LEDs

There are five LEDs on the front panel of the L-5500 unit. Each can display three colors: Red, Green, and Amber. The definition for each LED is as follows:

LED	OFF	GREEN	FLASHING GREEN	RED	FLASHING RED	AMBER
RSSI	No Power	Strong RSSI	N/A	Very Low RSSI	N/A	Medium or Low RSSI
SVC	No Service	EV-DO RevA	N/A	1xRTT	N/A	EV-DO Rev0
NET	No Power	Network Connected	Tx/Rx Activity	No Network Connection	N/A	Attempting Connection
GPS	No Power or Module Disabled	GPS Fix Valid	N/A	No Fix or Invalid Fix	N/A	Time Sync
WiFi	No Power or Interface Disabled	Interface Enabled	N/A	N/A	N/A	N/A

2.4.3. Back Panel Connections

The L-5500 radio modem's back panel connections include:

I/O: I/O interface connector

COM 2: Second serial port (optional, not pictured)

SIM: SIM card slot



Figure 2 - L-5500 radio modem's back panel

2.5. RJ-45 Ethernet Ports

The L-5500 radio modem can accept either standard or cross over ethernet cables.

2.6. Power Cable Connections

If using the provided power cable to connect to a DC supply (car battery) use the following diagrams and table to connect the unit.

Ensure the ignition sense line is connected to the vehicle's ignition. This line will initiate the shutdown timer following ignition deactivation (if enabled).

Note: Both ignition sense and DC power are required to start up an L-5500.

Caution: Connect the red power wire to a **CONSTANT** hot source. To prevent corruption of the L-5500 firmware, only use the ignition source to power off the unit.

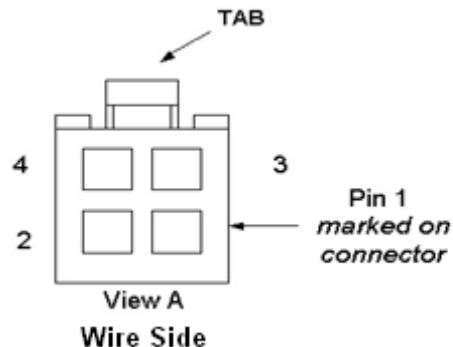


Figure 3 - L-5500 power cable connections

Pin	Color	Description
1	Red	DC Power, 9 to 28V DC
2	Blue	Ground
3	White	Ignition Sense
4	NA	Not Connected

2.7. Antenna Options

Antennas are available for L-5500 radio modems installations from Logic Data Systems.

2.7.1. Primary Cellular Antenna

The L-5500 product requires a multi-band cellular antenna for operation in the 800 MHz band, the 1900 MHz band, and the 2100 MHz band. The primary antenna connection on the L-5500 unit is an SMA female connector; therefore you must purchase an antenna with an SMA male connector. Do not select an SMA antenna with "reverse polarity" or RP-Male. Mounting options and cable lengths are the user's choice and application specific.

Caution: To comply with FCC approval for this device, do not use a cellular antenna with a gain greater than 5 dBi in the cellular (800MHz) band, or 4 dBi in the 1900MHz band.

2.7.2. RX Diversity Cellular Antenna

The L-5500 radio modem RX Diversity antenna has the same requirements as the primary antenna with the exception of the connection. The RX Diversity antenna connection on the L-5500 product is an SMA female connector; therefore an antenna with an SMA Male connection is required. Mounting options and cable lengths are the user's choice and application specific. For best performance, separation between the Primary and Diversity antenna should be at least 5/8 wavelength (=8 inches or 20 cm for 915 MHz).

Caution: To comply with FCC approval for this device, do not use a cellular antenna with a gain greater than 5 dBi in the cellular (800MHz) band, or 4 dBi in the 1900MHz band.

2.7.3. GPS Antenna

The L-5500 radio modem's GPS connector requires an external 3.3V GPS antenna. The GPS antenna connection on the L-5500 product is a female SMA connector; therefore an antenna with an SMA male connector is required. For best coverage, use an active antenna with a gain >25dB. Mounting options and cable lengths are user's choice and application specific.

2.7.4. WiFi Antenna

The WiFi antenna connection on the L-5500 product is an RP-SMA jack; therefore an antenna with an RP-SMA plug is required. Mounting options and cable lengths are user's choice and application specific.

2.7.5. Antenna Spacing

Referring to **Figure 4** for illustration, the L-5500 radio modem commonly uses four separate antennas:

- “T” - Main transceiver - Constraints are the limit of 20 cm and omni-directional factors
- “R” - Auxiliary receiver – Constraints are the receiver spacing of at least $5/8 \lambda$ (wavelength) from transceiver antenna and omni-directional requirements
- “G” - Global Positioning System (GPS) - Constraints are TX spacing of at least 60cm/23.62 inch from all transmitting antennas and a clear view of the sky.
- “W” – WiFi antenna - Constraints are TX spacing of at least 8 inches or 20 cm from all transmitting antennas

Note: For units utilizing diversity cellular antennas, best overall operation is achieved utilizing antennas with equal gains.

WARNING: As per FCC rules, all L-5500 transmitting antennas (T & W) should be at a minimum of eight (8) inches (approximately 20 centimeters) from all persons.

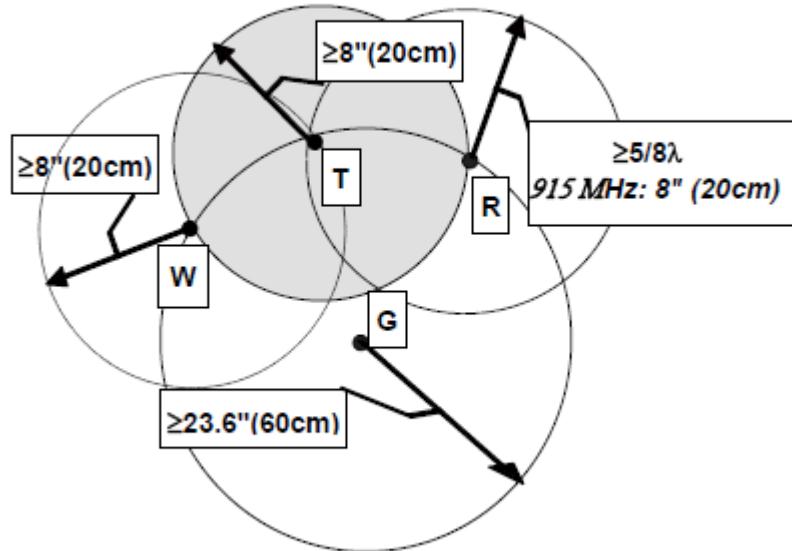


Figure 4 - Antenna Spacing (T: primary antenna, R: diversity antenna, W: WiFi antenna, G: GPS antenna)

For installation of ground-plane dependent antennas (main cellular and WiFi antennas), the center of the metal surface used for mounting is preferable for best omni-directional pattern. For ground-plane independent antennas (diversity and GPS antennas), installation may be close to the edges of the surface.

For vehicular installations Logic Data Systems recommends the following antenna positions:

- Most preferred for all antennas: centerline of roof. For transmitter antenna, it is the ONLY acceptable position.

- Less preferred for receiver antenna: trunk lid, providing distance to transmitting antenna is respected whether lid is opened or closed.
- Much less preferred, but permissible for receiver antenna: left or right rear fenders, just in back of rear window
- Least preferred, but permissible for receiver antenna: left or right front fenders, ahead of windshield

3. Networking Basics

3.1. General Networking Definitions

The L-5500 cellular modem is based on Ethernet connectivity and follows general IP networking guidelines and terminology. Below are definitions of some basic network terminology as they pertain to the L-5500 environment.

Term	Definition
DNS	Domain Name System: operates like a phone book to translate domain names (i.e., google.com) to IP addresses (70.212.19.1). The L-5500 unit functions as the DNS Server in the network.
DHCP	Dynamic Host Configuration Protocol: the DHCP server assigns IP addresses, gateway and subnet masks to all clients on the network. The L-5500 unit functions as a DHCP Server.
Dynamic/Static IP	A device with Dynamic IP selected may have a different IP address every time it connects to the network. A device with a Static IP will always connect with the same IP address.
Gateway	A (node) device enabling data transfer between different networks (i.e., from a private LAN to a public WAN).
LAN	Local Area Network. A private network.
NAT	Network Address Translation: A technology that allows hosts on the LAN with private IP addresses to communicate with public IP addresses on the WAN. This is an essential function of a network router.
Packet Data	Packet Data is used by 3G cellular standards. On a packet data network, users share a channel and the connection is always on.
Port	A special number present in the header of a data packet in the data transfer process. Ports are typically used to map data to a particular process running on a computer.
PPP	Point-to-point Protocol: creating a direct link between two nodes in network communication.
Private IP address	Private IP addresses are addresses that will not be routed on external networks. Any device on an internal LAN should be assigned a private IP address to avoid contention. The suggested private address ranges are Class A: 10.x.x.x Class B: 172.16.x.x through 172.31.x.x Class C: 192.168.x.x

	By default the L-5500 radio modem uses the 192.168.1.x address range.
Provisioning	The process of activating a unit for the first time on a cellular carrier's network. You must have a service contract in place with the carrier prior to provisioning your device.
SSID	Service Set Identifier. This is a name used to identify a WiFi wireless network.
Subnet	A range of addresses assigned to a LAN. All devices connected in an L-5500 network must be on the same subnet as the L-5500 radio modems.
Subnet Mask	Binary string that separates the subnet portion of an IP address and the host portion.
TKIP/AES	"Temporal Key Integrity Protocol" is an encryption method used by the WiFi interface when operating in WPA mode. TKIP was designed to solve security issues in WEP (it is considered stronger than WEP). "Advanced Encryption Standard" is the encryption protocol used by the WiFi interface when it operates in WPA2 mode.
WAN	Wide Area Network, a public network. The Internet is an example of a WAN.
WEP	Wired Equivalent Privacy. This is an IEEE security protocol for wireless 802.11 networks. It is an encryption method used by the WiFi interface.
WiFi (802.11b, 802.11g)	Wireless Fidelity is an IEEE 802.11 standard for wireless LANs <ul style="list-style-type: none"> • 802.11b is a standard for operating at 2.4 GHz frequency with data rates up to 11 Mbps • 802.11g is a standard for operating at 2.4 GHz frequency with data rates up to 54 Mbps
WiFi Access Point	An L-5500 unit can operate in 802.11 AP mode. It can communicate with other devices operating in 802.11 client mode.
WiFi Client (802.11 Infrastructure mode)	An L-5500 unit can operate in 802.11 Infrastructure mode. In this mode it is a WiFi client and will try to connect to a WiFi access point.
WLAN	Wireless Local Area Network, a private network. Refers to the network covered by the WiFi interface.
WPA/WPA2	"WiFi Protected Access" is a subset of 802.11i (security mechanisms for wireless networks). "WiFi Protected Access 2" is the complete version of 802.11i.

4. Getting Started

4.1. Package Contents

- L-5500 cellular modem
- Power cable and Fuse
- User Manual and Quick Start Guide
- Mounting Bracket and Screws

4.2. Setup Requirements

- L-5500 cellular modem
- Computer running any operating system
- 9 to 28 Volt power supply
- Ethernet cable*
- Active cellular data account
- Cellular antenna with male SMA connector*
- Cellular Diversity Antenna (SMA Male) *
- GPS Antenna (SMA Male) *
- WiFi Antenna (RP-SMA Plug) * (if applicable)

*These accessories are available from Logic Data Systems.

4.3. Quick Start

4.3.1. Hardware Setup

1. Connect the primary cellular antenna to the ANT connector on the front of the unit. For units utilizing diversity, install RX Diversity antenna on SMA connector. Connect the GPS antenna to the GPS connector. For units utilizing WiFi, connect the WiFi antenna to the WiFi connector.
2. Connect an Ethernet cable from the LAN connector of the L-5500 unit to the PC. If multiple PCs are being used, connect the L-5500 unit to an Ethernet switch or hub connected to the PCs.
3. Connect a power supply cable to the PWR connector of the L-5500 unit. Do not power the unit on yet.

4.3.2. Configuring Local PC

1. Verify network settings on local PC are set to automatically detect IP and DNS server. The path to network settings varies with the version of Windows you are using.

Windows XP: Start-> Control Panel -> Network Connections

Windows 2000: Start -> Settings -> Network and dial up connections

2. Select the appropriate network connection, typically the Local Area Connection -> right click on the connection and select "Properties"
3. Select "Internet Protocol (TCP/IP)" properties.
4. Verify that "Obtain an IP address automatically" and "Obtain DNS Server address automatically" are selected.

4.3.3. L-5500 Radio Modem Setup

1. Power on the L-5500 radio modem with 9-28VDC 15-Watt supply.
2. In an Internet browser, enter <http://192.168.1.50>. This will bring up the L-5500 product login page (Note: It may take 30 seconds from initial power-up for the homepage to be available.)
3. Login to the device

Default Values:

User logon: *admin*
password: *password*

4. This brings up the L-5500 product homepage. Status and configuration parameters are viewed from this screen. The configuration options are further explained later in this document.



Software Version: 5.0 (build 1b)
 Serial Number: 610205
 WAN IP Address: 120.254.183.36

Unit Status	Status
System Information	
Unit ID	
System Up Time 10078 seconds	
Software Version 5.0 (build 1b)	
Serial Number 610205	
Ethernet (LAN)	
IP Address 192.168.1.50	
Subnet Mask 255.255.255.0	
MAC Address 00:11:db:06:6e:86	
WiFi (WLAN)	
Status Up	
IP Address 192.168.2.50	
Subnet Mask 255.255.255.0	
MAC Address 00:19:70:94:7e:a5	
Cellular (WAN)	
Status Up	
IP Address 120.254.135.21	
Subnet Mask 255.255.255.252	
Cellular Connection	
Service Type 1xRTT	
Module Firmware D3600-STSUSHZ-1579 1 [Jul 05 2011 17:00:00]	
Roaming Status Home	
ESN 80450A29	
MEID A1000004BF44AF	
Signal Strength (dBm) -86 (strong)	
Call End Reason 0	
<input type="button" value="Refresh Status"/>	

©2012 Logic Data Systems LLC. All rights reserved.

Figure 5 - L-5500 radio modem Home page

4.4. Provisioning the L-5500 Radio Modem

IMPORTANT NOTE:

The L-5500 cellular radio modem requires an active cellular data service contract for provisioning. Verify that your cellular service contract is a data service contract with packet data NOT circuit switched technology. If you do not have an active data contract, contact your service provider.

Depending on your carrier, the L-5500 radio modem can be activated manually (see Figure 6) or using OTASP (Over-The-Air Service Programming) or IOTA (Internet Over-The-Air) (see Figure 6). In either case, the carrier will require you to provide them with the **MEID** that is assigned to the cellular modem at the factory. You can see your MEID by selecting the Cellular (WAN) page -> "Status" tab or on the label on the bottom of your L-5500 unit.

For manual activation, you will also need the following specific information from the provider:

- Mobile Directory number (**MDN**)
- Mobile Station ID (MSID or **MIN**). In many cases, this number will be the same as the MDN.
- Unlock Code (if required)-provided by most carriers when activating a contract.

Cellular (WAN)	Status	Activation	Dial Settings	Mobile IP	RSSI Traps
Manual-Entry Activation					
MDN	<input type="text"/>				
MIN	<input type="text"/>				
Unlock Code	<input type="text"/>				
<input type="button" value="Clear"/> <input type="button" value="Submit"/>					
Enable/Disable OMA-DM Activation					
Auto Activation	<input type="radio"/> Enable <input checked="" type="radio"/> Disable				
<input type="button" value="Cancel"/> <input type="button" value="Save"/>					
Manual initiation of OMA-DM Provisioning					
Activation Status	Activated				
<input type="button" value="OMA-DM"/>					

Figure 6 - Cellular (WAN) page, Activation

4.4.1. Provisioning with Verizon Wireless

1. On the left side of the screen, select the Cellular (WAN) page. Select "Activation" tab.
2. In the "OTASP/IOTA Activation" portion of the screen (Figure 9), select "OTASP". Click Submit.
Note: "Command (OTASP Only)" is a carrier specific command used for OTASP. The default value is *22899 (Verizon OTA command).
3. After a few moments you will receive a message saying the OTA was successful. Once OTA is complete, the unit will reset.
4. Once the module is activated, browse to an Internet web page to confirm connectivity.

Note: Should you experience problems connecting to the web page, reset the L-5500 unit by clicking RESET on the top right of the screen and try reconnecting to the web page.

4.4.2. Provisioning with Sprint

L-5500 cellular routers configured for Sprint are set to activate by default without user intervention. However, a manual activation may be initiated by performing the following steps.

1. On the left side of the screen, select the Cellular (WAN) page. Select "Activation" tab.
2. In the "Manual initiation of OMA-DM Provisioning" portion of the screen (**Figure 7**), select "OMA-DM".
3. After a few moments you will receive a message saying the OMA-DM was successful. Once OMA-DM is complete, the unit will reset.
4. Once the module is activated, browse to an Internet web page to confirm connectivity.

Note: Should you experience problems connecting to the web page, reset the L-5500 unit by clicking RESET on the top right of the screen and try reconnecting to the web page.

The screenshot shows two stacked configuration sections. The top section is titled 'Enable/Disable OMA-DM Activation' and contains a radio button group for 'Auto Activation' (selected), 'Enable' (unchecked), and 'Disable' (checked). Below this are 'Cancel' and 'Save' buttons. The bottom section is titled 'Manual initiation of OMA-DM Provisioning' and shows 'Activation Status' as 'Activated'. A large 'OMA-DM' button is at the bottom.

Figure 7 - Cellular (WAN) page, manual activation and auto activation for Sprint

The screenshot shows the 'Manual-Entry Activation' section of the Cellular (WAN) page. It includes fields for 'MDN' (with a placeholder box), 'MIN' (with a placeholder box), and 'Unlock Code' (with a placeholder box). At the bottom are 'Clear' and 'Submit' buttons.

Figure 8 - Cellular (WAN) page, Manual-Entry Activation

OTASP/IOTA Activation	
<i>Please ensure proper activation type (i.e., IOTA vs. OTASP). Unit will be reset after activation request!</i>	
Command (OTASP Only)	*22899
Status	
Activation Type	<input type="radio"/> OTASP <input type="radio"/> IOTA
<input type="button" value="Clear"/> <input type="button" value="Submit"/>	

Figure 9 - Cellular (WAN) page, OTASP/IOTA Activation

5. L-5500 Configuration

This section explains status information and configuration options available on all HTML pages.

5.1. General Instructions

The following instructions are common to all HTML pages

The Help, Home and Reset links are located at the top right of all HTML pages.

Help: Select this link on any of the devices configuration pages to bring up the help text for that screen.

Home: Select this link to return to the home page of the modem.

Reset: Select this link to command the unit to reboot. This process will take about 40 seconds. The software will ask you to confirm this command prior to re-booting.

Save: Most changes to a configuration parameter require the user to click save before the change will take effect.

Clear/Cancel: Most configuration menus also have a “Clear/Cancel” option. Selecting this button will restore all fields in a section to their last saved value. Note: This does not return them to their factory defaults.

5.2. Home Page Parameters

The L-5500 cellular modem home page lists the unit’s primary operating parameters and status. Configuration changes cannot be made from this page.

Status	
System Information	
Unit ID	test
System Up Time	16068 seconds
Software Version	2.0 (build 8)
Phone Module Version	41.67.01
Serial Number	00:11:DB:06:2D:A8
Default Route	Cellular (gateway:68.28.57.69)
Ethernet (LAN)	
IP Address	192.168.1.50
Subnet Mask	255.255.255.0
MAC Address	00:11:DB:06:2D:A8
WiFi (WLAN)	
Status	Down
IP Address	N/A
Subnet Mask	N/A
MAC Address	N/A
Cellular (WAN)	
Status	Up
IP Address	173.129.26.97
Subnet Mask	255.255.255.255
P-t-P	68.28.57.69
CDMA Connection	
Service Type	CDMA EVDO Service
Roaming Status	Not Roaming
ESN	60677531
Signal Strength (dBm)	-81 (strong)
Call End Reason	152
<input type="button" value="Refresh Status"/>	

Figure 10 - Home Page

5.2.1. Home Page Parameter Descriptions

System Information

Unit ID: Unit identification number (configured under Basic Settings).

System Up Time: System Up Time displays a counter that starts when the unit is powered on and resets when the unit is powered down or hardware reset.

Note: This counter does NOT indicate how long the WAN connection has been up.

Software Version: This reflects the version of application software loaded on the unit.

Phone Module Version: This is the version of the cellular module installed in the device. This may be required by tech support but is not required for any user applications.

Serial Number: This is assigned at the factory. This may be required by tech support but is not required for any user applications.

Default Route: Network route used by the L-5500 cellular radio modem when no other known route exists for a given IP packet's destination address.

The default route points to the Cellular interface when WAN is up. The only exception to this rule is if the WiFi interface is configured in wireless client mode and is connected to a WiFi access point (WiFi Status=Up). In that case, the default route will point to the WiFi interface.

Note: When the connection to the WiFi access point is down the default route is set back to the Cellular interface.

Ethernet (LAN)

IP Address: IP Lists the LAN IP address of the L-5500 unit. This IP becomes the gateway and DNS server for all PCs and devices connected on the LAN. This value is configured on the LAN Settings Page.

Subnet Mask: The Subnet mask is used in conjunction with the network address to partition the IP address into the network (subnet) portion and the host portion. In most cases, this value will be automatically set by the software based on the class of IP address used for the Ethernet IP. This value can be modified on the LAN Settings page.

MAC Address: Media Access Control Address, this is configured at the factory and cannot be changed by the user.

WiFi (WLAN)

Status: Indicates if the WiFi interface is "UP" or "DOWN"

IP Address: IP address assigned to the WiFi interface of this device. When the WiFi interface is set to operate in WiFi Client mode, the WiFi Access Point must have a DHCP server running to assign an IP address to its WiFi clients.

Subnet Mask: Subnet Mask assigned to the WiFi interface of this device.

MAC Address: Media Access Control Address of the WiFi interface.

Cellular (WAN)

Status: indicates if the device has an established connection to the WAN. Status is UP or DOWN

IP Address: WAN IP address of the L-5500 unit. Remote access for the device requires entering this address into a browser. The WAN IP Address is assigned by the cellular carrier and will be dynamic unless a static address is specifically requested

Warning: Be aware of the dynamic nature of the WAN IP Address as it can affect related applications.

Subnet Mask: This subnet mask is assigned by the carrier and is not configurable by the user.

P-t-P: WAN IP address of the network access point of the cellular carrier

CDMA Connection

Service Type: Service Type indicates the type of service connection. The L-5500 radio modem will automatically connect to the most advanced service available and will fall back to other networks (such as 1xRTT) when EV-DO Rev A is not available.

Roaming Status: Roaming Status indicates the unit roaming status. Status is ROAMING, NOT ROAMING, or a carrier specific value.

ESN: Electronic Serial Number is assigned to the cellular modem at the factory. This number must be provided to the carrier to activate the module.

Signal Strength: Receive Signal Strength Indication indicates the strength of the network signal with both a numerical value and a good/medium/poor message.

Call End Reason: Code indicating the reason for a call ending.

5.3. Cellular WAN Parameters

This page contains the provisioning information and the carrier activation settings. For more information on the procedure for carrier activation, see "Provisioning the L-5500 Radio Modem".

5.3.1. Status

WAN Status information available (Figure 11):

ESN: Electronic Serial Number is assigned to the cellular modem at the factory. This number must be provided to the carrier to activate the module.

MEID: Mobile Equipment Identifier is used by the cellular carrier as the means to identify the cellular module. This is the identifier used to set up the user account with the cellular provider.

IMEI: International Mobile Equipment Identity is the serial number of the GSM module in the modem.

SIM ID: ID of SIM card if inserted. Not applicable for modems configured for CDMA.

MDN/MTN: The Mobile Directory Number; assigned by the carrier when the module is activated.

MIN/MSI: Mobile Identification Number, in most cases, this is the same as the MDN.

PRL: Preferred Roaming List; a database that declares the priority of other carriers while roaming. This file should be updated periodically to ensure proper connectivity while roaming. The PRL file can be updated by performing an OTA or IOTA operation (see provisioning section).

SID: System ID, this is status only and is assigned by the carrier when connecting to the network.

NID: Network ID; this is status only and is assigned by the carrier when connecting to the network.

Signal Strength: Receive Signal Strength Indication indicates the strength of the network signal with both a numerical value and a good/medium/poor message.

Cellular (WAN)	Status	Activation	Dial Settings	Mobile IP	RSSI Traps	
Provisioning Information						
<i>Current Status (NOTE - please click refresh button on browser panel to refresh values)</i>						
	ESN	80450A29				
	MEID	A1000004BF44AF				
	IMEI	357485041679194				
SIM ID (ICC-ID)						
	MDN/MTN	0000008233				
	MIN/MSI	0000008233				
	PRL	60780				
	SID	0				
	NID	0				
	Signal Strength (dBm)	-89 (strong)				

Figure 11 - Cellular (WAN) Page

5.3.2. Activation

Provisioning information (see section 4.4)

5.3.3. Dial Settings

The Dial Settings page allows the user to Disable auto-connect. This page also contains information on the reconnect timers in the note under the "Connect" selection. These

reconnect timers are defined per carriers certification requirements; they cannot be changed.

By default, the auto-connect feature (labeled "Connect") is enabled. When this feature is enabled, the L-5500 radio modem will automatically connect to the network on power up. If the auto-connect is disabled, you must re-enable the auto-connect, then cycle power or perform a hardware reset to connect to the network. If you want to keep the auto-connection function disabled, you will have to disable it before powering down again.

This page also contains dial number, user and password information. This information should only be entered if required by your carrier.

Note: When establishing a connection to a provider's network, there are two ways your L-5500 modem can authenticate and receive its IP address: Mobile IP (MIP) or Simple IP (SIP). Most providers can allow a MIP-only account, a SIP-only account, or a MIP with SIP fallback account.

On a Mobile IP network, the L-5500 will maintain the same IP address over any geographical region, while on the SIP network IP addresses may change depending on the geographical location. If you are using a SIP account, the carrier must provide you with a username and password that should be entered under Cellular (WAN) -> Dial Settings. If the entries are left blank, the L-5500 modem will consider itself working with a MIP account.

Cellular (WAN)	Status	Activation	Dial Settings	Mobile IP	RSSI Traps
Dial Configuration					
Connect <input checked="" type="radio"/> Enable <input type="radio"/> Disable					
<i>Note: If Auto Connect is enabled and the modem fails to connect, the unit will attempt to reconnect one time and then one attempt per the following schedule: 1 minute, 2 minutes, 4 minutes, 8 minutes and then every 15 minutes.</i>					
Dial Number #777					
PPP Configuration					
User					
Password					
Authentication	<input checked="" type="radio"/> Auto <input type="radio"/> PAP <input type="radio"/> CHAP <input type="radio"/> MSCHAP <input type="radio"/> MSCHAPV2 <input type="radio"/> EAP				
Logs	<input type="radio"/> Enable <input checked="" type="radio"/> Disable				
Idle timeout	0 minutes				
<i>Note: PPP will be restarted if the link is idle for this amount of time. Recommended value is twice the AAVL report rate. 0 = disable.</i>					
<input type="button" value="Cancel"/> <input type="button" value="Save"/>					

Figure 12 - Cellular (WAN) page, Dial Settings

5.3.4. Mobile IP Settings

By default the Mobile IP settings are automatically configured by the cellular carrier following provisioning. In cases where Mobile IP settings must be modified, the Mobile IP page is available.

NOTE: The modem must be power cycled following configuration of the Mobile IP settings.

Mobile IP: *Disabled* – Permits Simple IP only. Using this setting may require PPP authentication parameters to be configured on the Dial Settings page.

Preferred – During the initial registration, mobile IP will be selected if supported by the network. If mobile IP is not available, the modem will revert to Simple IP.

Required – Allows only a mobile IP connection. If the modem hands off to a network that does not support mobile IP, the connection will be dropped and stay offline until a mobile IP network becomes available.

Reverse Tunneling: *Enabled* - the mobile node tunnels all transmissions back to the home agent for transmission back to the internet rather than sending datagrams directly.

Disabled – When the mobile node is on a foreign network, transmissions to the internet will be done directly rather than via a tunnel to the home agent.

NAI (Network Access Identifier): Identifier used by the AAA server to identify clients. This should be formatted in the form of an e-mail address, for example:
8884770911@sprintpcs.com.

HA SPI (Home Agent Security Parameter Index): Security parameter index required to authenticate on the primary and secondary home agents. Supported values: 0 to 4294967295.

HA (Home Agent) Shared Secret: Shared secret password for registration with the Home Agent. Once the HA Shared Secret is set, its value cannot be obtained from the modem. Thus, this field will always appear blank even after setting a value. To remove the password, check the *Clear* checkbox.

AAA SPI: Security parameter index required to authenticate on the AAA server. Supported values: 0 to 4294967295.

AAA Shared Secret: Shared secret password for registration with the AAA server.

Primary HA IP: IP Address of the primary home agent.

Secondary HA IP: IP Address of the secondary home agent.

Home HA IP: Primary HA address of the mobile node.

Note: When the *HA Shared Secret* or *AAA Shared Secret* fields are left blank, all other fields on the Mobile IP settings page will be updated except these. To change the HA or AAA shared secret, simply enter a value in the respective field.

Cellular (WAN)	Status	Activation	Dial Settings	Mobile IP	RSSI Traps
Mobile IP / Private Networking					
<i>WARNING: Configuring the Mobile IP settings before device activation could prevent the activation process from succeeding.</i>					
Mobile IP	Preferred				
Reverse Tunneling	<input type="radio"/> Disabled <input checked="" type="radio"/> Enabled				
NAI	8881770911@sprintpcs.com				
HA SPI	1234				
HA Shared Secret*	<input type="text"/>				
AAA SPT	1234				
AAA Shared Secret*	<input type="text"/>				
Primary HA IP	255	.	255	.	255
Secondary HA IP	68	.	28	.	57
Home HA IP	0	.	0	.	0
<i>* NOTE: To change a password, enter a value in the password field. Otherwise, leave the field blank to maintain the existing password.</i>					
<input type="button" value="Cancel"/> <input type="button" value="Save"/>					

Figure 13 - Cellular (WAN), Mobile IP Settings Page

5.4. LAN Settings

Ethernet (LAN)	IP Settings	MAC Pairing
IP Configuration		
IP Address	192 . 168 . 1 . 50	
Subnet Mask	255 . 255 . 255 . 0	
DNS Masquerade		
DNS Auto	<input checked="" type="radio"/> Enable <input type="radio"/> Disable	
DHCP Server Configuration		
DHCP Server	<input checked="" type="radio"/> Enable <input type="radio"/> Disable	
Start IP Address	192 . 168 . 1 . 120	
End IP Address	192 . 168 . 1 . 200	
Lease Time	86400	(seconds)
Domain Name Suffix		
Preferred DNS Server	192 . 168 . 1 . 50	
Alternate DNS Server	0 . 0 . 0 . 0	
		<input type="button" value="Cancel"/> <input type="button" value="Save"/>

Figure 14 - LAN Settings Page

The LAN Settings page contains the basic configuration information required to customize your LAN with the L-5500 radio modem as the network connection point. User configuration will primarily occur on this page.

5.4.1. IP Settings

5.4.1.1. IP Configuration

Ethernet IP address: LAN IP of the L-5500 radio modem. This address is entered into a browser on a local PC when logging into the L-5500 radio modem home page. To decrease the chances of unwanted access, this value should be changed from its default prior to use.

IMPORTANT NOTE:

Changing this value will cause you to lose connection to the L-5500 unit. Enter the new address in the browser to reconnect. If you forget an address or make a mistake entering the new value, it may be difficult to reconnect to the device.

Ethernet Subnet Mask: The Subnet mask is used in conjunction with the Ethernet IP address to partition the address into the network (subnet) portion and the host portion. This

value will be entered automatically by the software based on the class of IP address entered. It is not necessary to change the default value once the Ethernet IP is entered.

5.4.1.2. DNS Masquerade

See the definition for DNS in Network Basics in section 3.1 above.

DNS Auto: This command enables / disables the L-5500 DNS server. Except in special cases, this should always be enabled.

5.4.1.3. DHCP Server Configuration

DHCP Server: (Dynamic Host Configuration Protocol) A protocol used by client devices that are connected to the LAN port of this device to automatically obtain an IP address assigned by this server/router. Selecting Enable will configure this device to assign IP addresses to client devices taken from a pool specified by the values entered in DHCP start range and DHCP end range. If DHCP is disabled, the information must be entered manually on all PCs.

DHCP Start IP Address/End IP Address: Sets the range of IP addresses assigned to the PCs. The user can limit the number of devices allowed on the network by limiting the range of IP addresses.

DHCP Lease Time: Number that dictates the length of time a device on the LAN can hold an IP address. In most cases, this should be set to the maximum (default value) of 86400. If this value is set too low, it can cause network connectivity problems.

Domain Name Suffix: The DNS suffix to be assigned by the DHCP server.

Preferred DNS Server: IP address of the preferred DNS server. This value is automatically set when *DNS Auto* is enabled.

Alternate DNS Server: IP address of the alternate DNS server. This value is automatically set when *DNS Auto* is enabled.

5.4.1.4. Disabling DHCP Server

When DHCP server is enabled, any PC with physical access to the L-5500 Ethernet port will be assigned an IP address and have access to browse the Internet. This may cause security problems. Disabling DHCP server will allow the user to control which PCs have the ability to connect through the L-5500 radio modem. *If changes are made to the network settings, be sure to keep a record of the changes for future use.*

- Disabling DHCP server is performed on the LAN settings page. Under the DHCP section, select Disable, the click Save.

IMPORTANT NOTE:

This also disables DNS Masquerading. Disabling DHCP server will remove all values in the DHCP and DNS sections. Record all values in these fields prior to disabling in case you are required to go back to the original configuration.

On the network setting page of each PC, set the IP address, subnet mask, and default gateway.

5.4.1.5. **Static IP Setup**

If your network requires each PC to have a statically set LAN IP addresses, follow the previous procedure for all PCs on the network. If the network requires a mix of static and dynamically assigned IP addresses, assign static IPs outside the DHCP address range for PCs that require static IP addresses and allow the L-5500 radio modem DHCP to assign the remaining PC IP addresses.

5.5. WiFi (WLAN)

An L-5500 unit can operate in an access point mode or client mode.

In access point mode, the L-5500 radio modem offers wireless tether. It forwards local WiFi traffic to application servers over the cellular network and works in parallel with Ethernet connection, providing for simultaneous WiFi and Ethernet connections.

In client mode the L-5500 unit can automatically switch between cellular and WiFi connections providing for seamless handover when coupled with modern applications.

5.5.1. WiFi (WLAN) - Main

WiFi settings provide user configuration for optional WiFi interface operation.

WiFi (WLAN)	Main	Wireless Settings (Client)	Wireless Settings (Access Point)	Stats	Site Survey
Configuration					
Wireless Mode <input type="radio"/> Disable <input type="radio"/> Client <input checked="" type="radio"/> Access Point					
Status					
IP Address	192.168.2.50				
Subnet Mask	255.255.255.0				
SSID	LogicWiFi				
Authentication	WPA2-PSK				
Encryption	TKIP+AES				
Channel	6				
State	Ready				
RSSI	-				
<input type="button" value="Save"/> <input type="button" value="Refresh"/>					

Figure 15 - WiFi (WLAN) -> Status

5.5.1.1. Configuration

Wireless Mode

Disable: The WiFi interface is disabled

Client: The WiFi interface operates in Client mode

Access Point: The WiFi interface operates in Access Point mode

5.5.1.2. Status

IP Address: IP address assigned to the WiFi interface

Subnet Mask: IP Subnet Mask assigned to the WiFi interface

SSID: Name of the wireless local area network

Authentication: Authentication method currently used (Example: Open, Shared, WPANONE, WPA-PSK, WPA2-PSK)

Encryption: Encryption method currently used

Channel: Channel currently used (Auto or 1-11)

State: Current state of the WiFi interface (Disabled, Ready if in Access point Mode, or Not Connected, Scanning, and Connected if in Client Mode)

RSSI: Received Signal Strength Indicator (displayed in Client Mode only)

5.5.2. WiFi (WLAN) - Wireless Settings (Client)

The L-5500 can be configured for up to 20 access points.

Note: All access points must run a DHCP server.

In wireless client mode, the L-5500 unit will try to connect to the Access Point with the strongest signal on the list. When the L-5500 unit connects to an access point, it starts a DHCP client service. The DHCP server running on the access point must provide an IP address, netmask, and gateway to the L-5500 unit. When the WiFi client is connected to a WiFi access point, the default route is set to point to the gateway address obtained by the DHCP client.

WiFi (WLAN)	Main	Wireless Settings (Client)	Wireless Settings (Access Point)	Stats	Site Survey
Wireless Settings					
Access Point Number	[] (1-20)				
SSID	[]				Any <input type="checkbox"/>
Channel	Auto <input type="button" value="▼"/>				
Authentication	Open <input type="button" value="▼"/>				
Encryption	None <input type="button" value="▼"/>				
WEP Key Length	64-bit <input type="button" value="▼"/>				
WEP Key Type	ASCII(Text) <input type="button" value="▼"/>				
WEP Key Index	[] (1-4)				
Key	[]				
<input type="button" value="Clear"/> <input type="button" value="Add"/>					
Wireless Access Point Summary					
No	SSID	Channel	Authentication	Encryption	
-- Wireless Access Point Table Empty --					

Figure 16 - WiFi (WLAN) -> Wireless Settings (Client)

5.5.2.1. Wireless Settings

Access Point Number: Access point number (automatically assigned)

SSID: Service Set Identifier. This is the name of the wireless local area network.

Channel: RF channel number (Auto or 1 to 11)

Authentication: Authentication method to be used (Example: Open, Shared, WPANONE, WPA-PSK, WPA2-PSK)

Encryption: None, WEP, TKIP, or AES

WEP Key Length: Bit key length

WEP Key Type: Type of WEP security

WEP Key Index: Index of WEP Key (1 to 4)

Key: Encryption key

Note: For a 64-bit key, keys are 5 character strings long if WEP Key Type is set to ASCII and 10 hexadecimal digits long if WEP Key Type is set to HEX.

For a 128-bit key, keys are 13 character strings long if WEP Key Type is set to ASCII and 26 hexadecimal digits long if WEP Key Type is set to HEX.

5.5.3. WiFi (WLAN) – Wireless Settings (Access Point)

WiFi (WLAN)	Main	Wireless Settings (Client)	Wireless Settings (Access Point)	Stats	Site Survey
IP Settings					
IP Address	192 . 168 . 2 . 50				
Subnet Mask	255 . 255 . 255 . 0				
DNS Masquerade					
DNS Auto	<input checked="" type="radio"/> Enable <input type="radio"/> Disable				
DHCP Server					
DHCP Server	<input checked="" type="radio"/> Enable <input type="radio"/> Disable				
Start IP Address	192 . 168 . 2 . 120				
End IP Address	192 . 168 . 2 . 200				
Lease Time	86400 (seconds)				
Domain Name Suffix					
Preferred DNS Server	192 . 168 . 2 . 50				
Alternate DNS Server	0 . 0 . 0 . 0				
Wireless Settings					
SSID	LogicWiFi				
Channel	7				
Authentication	WPA2 - PSK				
WPA Encryption	TKIP + AES				
WEP Key Type	64-bit ASCII(Text)				
WEP Key Index	1 (1-4)				
Key	8884770911				

Figure 17 - WiFi (WLAN) -> Wireless Settings (Access Point)

5.5.3.1. *IP Settings*

IP Address: IP address of the WiFi interface

Subnet Mask: The network mask of the WiFi interface

5.5.3.2. *DNS Masquerade*

DNS Auto: Enables or disables the L-5500 DNS server on the WiFi interface

5.5.3.3. *DHCP Server*

DHCP Server: Enables or disables DHCP server on the WiFi interface

Start IP Address: Starting IP address (defines the pool of addresses allocated for DHCP purpose)

End IP Address: Ending IP address (defines the pool of addresses allocated for DHCP purpose)

Lease Time: The period over which the IP address allocated to a DHCP client is referred to as a “lease”. Lease duration is the amount entered in seconds.

Domain Name Suffix: DNS suffix to be assigned by the DHCP server

Preferred DNS Suffix: IP address of the preferred DNS server

Alternate DNS Suffix: IP address of the alternate DNS server

5.5.3.4. *Wireless Settings*

SSID: Service Set Identifier. This is the name of the wireless local area network.

Channel: Channel number to use (Auto or 1-11)

Authentication: Authentication method to be used (Example: Open, WEP-Shared, WPA - PSK, WPA2 - PSK, WPA/WPA2 - PSK)

WPA Encryption: Encryption method currently used

WEP Key Type: Type of WEP security (only applicable when WEP authentication is used)

WEP Key Index: 1-4 (only applicable when WEP authentication is used)

Key: The encryption key

Note: For a 64-bit key, keys are 5 character strings long if WEP Key Type is set to ASCII and 10 hexadecimal digits long if WEP Key Type is set to HEX.

For a 128-bit key, keys are 13 character strings long if WEP Key Type is set to ASCII and 26 hexadecimal digits long if WEP Key Type is set to HEX.

5.5.4. WiFi (WLAN) – Stats

WiFi (WLAN)	Main	Wireless Settings (Client)	Wireless Settings (Access Point)	Stats	Site Survey
Transmit					
TX Packets	0				
TX Bytes	0				
Receive					
RX Packets	0				
RX Bytes	0				
<input type="button" value="Refresh"/>					

Figure 18 - WiFi (WLAN) -> Wireless Settings (Stats)

5.5.4.1. *Transmit*

TX Packets: Number of packets sent by the L-5500 over the WiFi interface

TX Bytes: Number of bytes sent by the L-5500 over the WiFi interface

5.5.4.2. *Receive*

RX Packets: Number of packets received by the L-5500 over the WiFi interface

RX Bytes: Number of bytes received by the L-5500 over the WiFi interface

5.5.5. WiFi (WLAN) – Site Survey

WiFi (WLAN)		Main	Wireless Settings (Client)	Wireless Settings (Access Point)	Stats	Site Survey
Wireless Site Summary						
BSSID	SSID	Channel	Authentication	Encryption	RSSI	
-- Wireless Site Table Empty --						

Figure 19 - WiFi (WLAN) -> Wireless Settings (Site Survey)

When the WiFi interface of the L-5500 unit operates in Client mode, this screen shows the WiFi Access Point detected during last wireless scan.

The list is empty when the L-5500 unit is operating in Access Point mode.

5.6. Router Settings

Router Settings	Settings	Table			
RIP Routing					
RIP Enable <input type="radio"/> Enable <input checked="" type="radio"/> Disable					
<input type="button" value="Cancel"/> <input type="button" value="Save"/>					
Static Routes					
Route no	<input type="text" value="1-65535"/>				
Route Name	<input type="text"/>				
Destination IP Address	<input type="text"/>				
IP Subnet Mask	<input type="text"/>				
Gateway IP Address	<input type="text"/>				
Metric	<input type="text" value="1-65535"/>				
<input type="button" value="Clear"/> <input type="button" value="Add..."/>					
Static Routing Table					
Item	Route Name	Dest IP	Subnet Mask	Gateway IP	Metric
-- Static Routing Table Empty --					

Figure 20 - Router Settings Screen

5.6.1. Static Routes

The L-5500 will automatically set up routing to all devices on the same subnet. In some cases however, the L-5500 unit may need to communicate with a previously existing subnet other than its own. This route cannot automatically be generated; it must be manually entered as a static route by the user. The static route gives the L-5500 its “next hop” instructions.

Route no: A generic number assigned to the route. Multiple static routes can be assigned as long as they have distinct route numbers.

Route Name: Nickname assigned to the route by the user.

Destination IP Address: This is the destination IP address that is delivered to the L-5500 radio modem. Since this IP address will not be on the same subnet, the L-5500 will not have a defined route, and will not know where to send it by default. Setting up the static route will inform the L-5500 where to send the data.

IP Subnet Mask: The subnet mask is defined by the subnet mask of the destination address

Gateway IP Address: This is the address that the data packet will be routed to.

Note:

The device at this address must be a router that is either on the same subnet as the Destination IP or one with its own statically setup route to the destination address. If this is not the case, the packet data will be dropped.

Metric: This sets the priority of the routes compared to other static routes defined. The lower the number, the higher priority the route.

Click on "Add" when all necessary information has been entered. The route will be shown on the bottom of the screen (under Static Routing Table). Additional routes can be added provided they have a unique Route no, name and metric. Routes can be deleted by clicking the Delete Entry option of the desired entry.

Note:

Routing Table (found under "Table" tab) shows all routes, while **Static Table** (found under "Settings" tab) shows manually entered routes only.

5.6.2. Routing Table

The table in Figure 21 shows a list of all routes (static and dynamic). The WAN connection appears as interface eth1.

Router Settings		Settings	Table					
Routing Table								
Dest IP	Gateway IP	Subnet Mask	Flags	Metric	Ref	Use	Iface	
192.168.2.0	0.0.0.0	255.255.255.0	U	0	0	0	wlan0	
192.168.1.0	0.0.0.0	255.255.255.0	U	0	0	0	eth0	

Figure 21 - Routing Table

5.7. Advanced Settings

5.7.1. Advanced Settings – NAT and Port Forwarding (Mapping)

When NAT is enabled, the LAN (Ethernet) is considered private, the WAN is considered public. Any IP packets leaving the L-5500 unit through the WAN interface will have its source IP address changed to that of the WAN interface.

Any data transfer must be initiated from the private side of the network toward the public side.

Port Forwarding is used to provide remote access to third party devices on the LAN, such as Web Cameras or printers. Port Forwarding routes incoming requests from the WAN, with a specific port to a local device with a static IP.

Advanced Settings																																																	
NAT Dynamic DNS IP Filters IPsec Remote Admin Power Management																																																	
NAT Support																																																	
<table border="1"><tr><td>NAT</td><td><input checked="" type="radio"/> Enable</td><td><input type="radio"/> Disable</td></tr><tr><td colspan="3">Cancel Save</td></tr></table>							NAT	<input checked="" type="radio"/> Enable	<input type="radio"/> Disable	Cancel Save																																							
NAT	<input checked="" type="radio"/> Enable	<input type="radio"/> Disable																																															
Cancel Save																																																	
Port Forwarding Support																																																	
<table border="1"><tr><td>Port Forwarding</td><td><input checked="" type="radio"/> Enable</td><td><input type="radio"/> Disable</td></tr><tr><td colspan="3">Cancel Save</td></tr></table>							Port Forwarding	<input checked="" type="radio"/> Enable	<input type="radio"/> Disable	Cancel Save																																							
Port Forwarding	<input checked="" type="radio"/> Enable	<input type="radio"/> Disable																																															
Cancel Save																																																	
Port Forwarding Configuration																																																	
<table border="1"><tr><td>Mapping no</td><td colspan="5"><input type="text"/></td></tr><tr><td>Protocol</td><td colspan="5"><input type="text" value="tcp"/></td></tr><tr><td>Source IP Address</td><td colspan="5"><input type="text"/></td></tr><tr><td>Incoming Port</td><td colspan="5"><input type="text"/> (1-65535)</td></tr><tr><td>Destination IP Address</td><td colspan="5"><input type="text"/></td></tr><tr><td>Destination Port</td><td colspan="5"><input type="text"/> (1-65535)</td></tr><tr><td colspan="6"></td><td>Clear Add...</td></tr></table>							Mapping no	<input type="text"/>					Protocol	<input type="text" value="tcp"/>					Source IP Address	<input type="text"/>					Incoming Port	<input type="text"/> (1-65535)					Destination IP Address	<input type="text"/>					Destination Port	<input type="text"/> (1-65535)											Clear Add...
Mapping no	<input type="text"/>																																																
Protocol	<input type="text" value="tcp"/>																																																
Source IP Address	<input type="text"/>																																																
Incoming Port	<input type="text"/> (1-65535)																																																
Destination IP Address	<input type="text"/>																																																
Destination Port	<input type="text"/> (1-65535)																																																
						Clear Add...																																											
IP Mapping Table																																																	
Item	Protocol	Incoming Address	Incoming Port	Destination Address	Destination Port																																												
-- IP Mapping Table Empty --																																																	

Figure 22 – Port Forwarding & NAT Screen

NAT: Network Address Translation (NAT) on the WAN interface of the L-5500 unit. When NAT is enabled, the LAN (Ethernet) is considered private, the WAN is considered public. Any IP packets leaving the L-5500 unit through the WAN interface will have its source IP address changed to that of the WAN interface.

Port Forwarding: Enable - The L-5500 unit performs port forwarding. The "IP Mapping Table" contains the rules used to perform port forwarding. Disable - The L-5500 unit does not perform port forwarding on the WAN interface.

Mapping Number: User selected generic number assigned for this route.

Protocol: TCP, UDP, or both - driven by the protocol used by the third party device

Source IP Address: Enter the IP address of the remote PC connecting to the third party device. (This should only be done if a single PC with a STATIC IP is accessing the device and you want to limit access to the device.) If you will be accessing the third party device from multiple PCs, or from a PC that has a dynamically assigned WAN IP, enter 0.0.0.0 (wildcard) to allow all remote PCs to access the third party device.

Incoming Port: Enter the port or port range of incoming requests. This can be any non-conflicting port (can be the same as the destination port). This value must be entered following the L-5500 IP address into a browser on a remote PC to access the third party device.

Destination IP Address: IP address of third party device; must be on the same subnet as the L-5500.

Destination Port: Enter the port of the third party device. This will be assigned to the device by the third party manufacturer and should be in the user manual of the third party device.

IMPORTANT NOTE:

The password protection on the L-5500 product does not protect logging into a third party device. The third party device must provide its own password protection (confirm if password protection is required).

Click Add when route configuration is complete. The route will be displayed at the bottom of the page. Additional routes may be added but require a unique mapping number and port number. Routes can be deleted (cleared) if no longer needed.

Once the route of the third party device is added you can enter the following on a remote PC to access the third party device.

5.7.2. Advanced Settings – Dynamic DNS (NO-IP Configuration)

Dynamic DNS is an option for remote monitoring if a static WAN IP address is not available or not yet assigned. When Dynamic DNS is activated, the L-5500 radio modem will register its dynamically assigned IP address with NO-IP's application, allowing the user to login to the device remotely without knowing the IP address of the L-5500 radio modem.

A number of providers offer services to track dynamic IP addresses and map them to constant domain names. The L-5500 product supports connection with NO-IP.com, one provider of this service.

NOTE:

As it is more reliable, Logic Data Systems recommends the use of a static IP whenever possible.

Advanced Settings		NAT	Dynamic DNS	IP Filters	IPsec	Remote Admin	Power Management
NO-IP Configuration							
NO-IP		<input type="radio"/> Enable <input checked="" type="radio"/> Disable					
User at NO-IP.com		user@xyz.com					
NOIP Password		*****					
Hostname		yourdomain.no-ip.info					
Update Interval		30	(0 - 65535) minutes				

Figure 23 – Dynamic DNS (NO-IP Configuration) Setup Screen

NO-IP: Enable / Disable (disabled by default)

User at NO-IP.com: User name setup at NO-IP.com. This information is required when logging into your account.

NOIP Password: Password used when logging into your account at NO-IP.

Hostname: This is unique domain name setup on your NO-IP account. This is the domain name entered into a browser to remotely login to the L-5500 radio modem. You may have multiple host names registered on the same account. See section below for instructions to set up NO IP account and host name.

IMPORTANT NOTE:

Do not assign more than one L-5500 unit the same domain name.

Update Interval: This setting determines how often the device will update its IP information at NO-IP. The IP addresses assigned by the carrier are dynamic; therefore it is necessary to update the registered IP periodically. Setting a high value in this field may cause extended periods of no connection but will reduce the number of times the L-5500 registers, decreasing the amount data used on the contract. Setting a low value minimizes the chance of lost network connection but will increase the total amount of data used on the contract.

The L-5500 radio modem will always register when first powered up or upon hardware reset.

5.7.2.1. *Instructions for NO IP Setup*

1. Setup up an account at NO-IP.com <http://www.no-ip.com/>. You will need to setup a user name and password on your account
2. On No-IP, create a host account for each device you want to remotely monitor. The domain name you set up here will be used to remotely login to the device.
3. On the L-5500 radio modem, click “Dynamic DNS” on the left side of the web Browser.

4. Enable NO-IP
5. Enter your NO-IP username, password and hostname for this device (do not assign the same host name to multiple devices.)
6. Set the update interval (30 minutes is the default).
7. After registration is complete, you can login into the unit or use the port forwarding feature by entering the hostname into a web browser followed by the port number.

(Example <http://L-5500.no-ip.biz:8080>)

5.7.3. Advanced Settings – IP Filter

IP Filtering provides certain Internet firewall protection. The user can enter up to 20 IP filters. Each IP filter is identified by a unique number (from 1 to 20). When IP filtering is enabled, any custom IP filters entered by the user as well as predefined IP filters will be taken into account when processing IP packets.

An IP packet passes through the filtering logic when IP filtering is enabled:

1. An IP packet is received on one of the interface and is destined to the L-5500 unit, or ...
2. An IP packet is sent by the L-5500 unit, or ...
3. An IP packet is forwarded by the L-5500 unit.

5.7.3.1. Predefined IP Filters

Predefined IP Filters		
Drop Remote Pings	<input type="radio"/> Enable	<input checked="" type="radio"/> Disable
Drop Remote IP Fragments	<input type="radio"/> Enable	<input checked="" type="radio"/> Disable
Drop Invalid Packets	<input checked="" type="radio"/> Enable	<input type="radio"/> Disable

Figure 24 – Advanced Settings -> IP Filters, Predefined IP Filters section

Drop Remote Pings: If enabled, any ICMP echo request coming from the WAN interface will not be replied to. This prevents remote hosts from detecting your IP address on the WAN.

Drop Remote IP Fragments: If IP filtering is enabled, any fragmented IP packets coming from the WAN interface will be dropped.

Drop Invalid Packets: If IP filtering is enabled, any invalid IP packets received by the unit will be silently dropped. An invalid IP packet is one that cannot be identified for some reason.

5.7.3.2. Add Custom IP Filters

Fill in the parameters described below and click "Add ...". Your entry should appear in the **Custom IP Filters** table on the bottom of the page.

Add Custom IP Filter		
Filter Number	<input type="text"/> (1-20)	
Source IP Address	<input checked="" type="radio"/> Any <input type="radio"/> <input type="text"/> . <input type="text"/> . <input type="text"/> . <input type="text"/> <input type="radio"/> <input type="text"/> . <input type="text"/> . <input type="text"/> . <input type="text"/> / <input type="text"/>	Exclude <input type="checkbox"/> <input type="checkbox"/>
Destination IP Address	<input checked="" type="radio"/> Any <input type="radio"/> <input type="text"/> . <input type="text"/> . <input type="text"/> . <input type="text"/> <input type="radio"/> <input type="text"/> . <input type="text"/> . <input type="text"/> . <input type="text"/> / <input type="text"/>	Exclude <input type="checkbox"/> <input type="checkbox"/>
Protocol	<input checked="" type="radio"/> Any <input type="radio"/> ICMP <input type="radio"/> TCP <input type="radio"/> UDP <input type="radio"/> Other <input type="text"/> (1-255)	Exclude <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Source Port	<input checked="" type="radio"/> Any <input type="radio"/> <input type="text"/> (1-65535) <input type="radio"/> <input type="text"/> to <input type="text"/> (1-65535)	Exclude <input type="checkbox"/> <input type="checkbox"/>
Destination Port	<input checked="" type="radio"/> Any <input type="radio"/> <input type="text"/> (1-65535) <input type="radio"/> <input type="text"/> to <input type="text"/> (1-65535)	Exclude <input type="checkbox"/> <input type="checkbox"/>
Direction	<input checked="" type="radio"/> Any <input type="radio"/> <input type="text"/> wan2eth	Exclude <input type="checkbox"/>
Action	<input checked="" type="radio"/> Keep <input type="radio"/> Drop	

Figure 25 – Advanced Settings -> IP Filter, Add Custom IP Filter section

Note: Criteria are for inclusion by default. Select "exclude" if your criterion is for exclusion.

Filter Number: Each IP filter is identified by a unique number from 1 to 20.

Source IP Address:

- **Any:** Any source IP address will satisfy these criteria
- **Specific:** A specific Host IP address
- **Range:** A range of IP addresses

Destination IP Address:

- **Any:** Any destination IP address will satisfy these criteria
- **Specific:** A specific Host IP address
- **Range:** A range of IP addresses

Protocol:

- **Any:** Any protocol number
- **ICMP:** The ICMP protocol (1)
- **TCP:** The TCP protocol (6)
- **UDP:** The UDP protocol (17)
- **Other:** Any other IP protocol (specify number a number between 1 and 255)

Source Port:

- **Any:** Any source port number
- **Specific:** A specific source port range
- **Range:** A range of source port numbers

Destination Port:

- **Any:** Any destination port number
- **Specific:** A specific destination port number
- **Range:** A range of destination port numbers

Direction: The direction corresponds to the path taken by the IP packet inside the L-5500 unit.

Action:

- **Keep:** If IP filtering is enabled and an IP packet matches all criteria in the IP filter, keep the IP packet (continue normal processing of the packet).
- **Drop:** If IP filtering is enabled and an IP packet matches all the criteria in the IP filter, drop the packet.

5.7.3.3. Delete Custom IP Filters

Custom IP Filters								
No	Src IP	Dst IP	Proto	Src Port	Dst Port	Dir	Act	
1	192.168.1.2	any	any	N/A	N/A	any	drop	Del

Figure 26 – Advanced Settings -> IP Filters, Custom IP Filters table

Click the **Del** link to delete the corresponding filter entry.

5.7.4. Advanced Settings – IPsec

5.7.4.1. IPsec Support

Selecting Enable will launch the IPSEC process and start all the enabled set tunnels. Selecting Disable will stop all tunnels and shutdown the main process. All the enabled tunnels will be launched automatically when the unit connects to the cellular carrier.

5.7.4.2. IPsec Configuration

Tunnel Configuration	
Tunnel no	<input type="text"/> Enabled <input checked="" type="checkbox"/>
Label	<input type="text"/>
Remote IP Address	<input type="text"/>
Remote Subnet	Enabled <input checked="" type="checkbox"/> <input type="text"/>
Local Subnet	Disable <input type="button" value="▼"/>
Encryption	AES-128 <input type="button" value="▼"/>
Pre-shared Key	<input type="text"/>
Dead Peer Detection	
Delay	30 <input type="text"/> seconds
Timeout	120 <input type="text"/> seconds
Action	Restart by peer <input type="button" value="▼"/>

Figure 27 – Advanced Settings -> IPsec, Tunnel Configuration section

Tunnel no: Tunnel number, start at 1 and increment for each new tunnel. If you want to modify an existing tunnel, use its number from the table below. The Enabled checkbox will enable autostart directly after you saved the tunnel.

Label: This is a convenience label used to differentiate tunnels easily.

Remote IP Address: The L-5500 is considered the left local side. The remote IP is the address of the right remote side where the unit will connect to establish a tunnel.

Remote Subnet: If you tick the *Enabled* checkbox, enter the IP netmask protected on the remote side, for instance 10.0.0.0/24. If checkbox is not ticked, no subnet will be used and encryption will only occur when the destination IP is the VPN gateway itself (Remote IP address above). This is useful if you use port forwarding from your VPN gateway to servers.

Local Subnet: Use the drop down list to select which local subnet should be used for the tunnel. When LAN is selected, all traffic from the LAN subnet that's transmitted to an IP matching the remote subnet will be encrypted. Likewise, when WLAN is selected, all traffic transmitted from the WLAN to a subnet matching the remote private subnet, will be encrypted.

Encryption: Select between AES-128 or AES-256 encryption.

Pre-shared Key: Matching key residing on the remote server.

Keep-Alive Delay: Length of time following the last receipt of traffic across the tunnel before sending an IPSec R-U-THERE request. Default value: 30 seconds.

Timeout: Duration following receipt of last R-U-THERE-ACK messages (in response to R-U-THERE requests) before considering tunnel down.

Action: Action to take when the peer is determined to be dead.

5.7.4.3. Tunnel Table

This is the table of configured tunnels. To delete an entry, click the corresponding **Delete Entry** link.

Tunnel Table									
Item	Enabled	Label	Remote IP	Remote SubNet	Local Subnet	Encryption	Pre-shared Key	Status	
1	<input type="checkbox"/>	GPSLogic	70.182.140.201	Disabled	Ethernet LAN	AES-128	Yes	View	Delete Entry

Figure 28 – Advanced Settings -> IPsec, Tunnel Table section

5.7.5. Advanced Settings – Remote Admin

Advanced Settings	NAT	Dynamic DNS	IP Filters	IPsec	Remote Admin	Power Management
Remote Administration						
Remote Configure	<input checked="" type="radio"/> Enable <input type="radio"/> Disable					
Incoming Port	8080	(1 - 65534)				
Admin Password						
Confirm Password						

Figure 29 – Advanced Settings -> Remote Admin page

Remote Configure: Selecting Enable will allow remote access to the modem's configuration screens through the cellular network connection. Selecting Disable will shut off the ability to remotely access the modem's configuration screens.

Incoming Port: Change the port of incoming requests. It is not necessary to change this parameter unless it conflicts with other devices on the network.

Admin Password: Set the password for **BOTH** remote login and local login. The password must be entered twice for the password to change.

5.7.6. Advanced Settings – Power Management

Advanced Settings	NAT	Dynamic DNS	IP Filters	IPsec	Remote Admin	Power Management
Power Configuration						
Shutdown Method	<input type="radio"/> Disabled <input checked="" type="radio"/> Power Off <input type="radio"/> Hibernate					
After ignition line off	Shutdown in 240 minutes					
When supply Voltage drops to	11.0	Volts (set to 0 to turn off)				

Figure 30 – Advanced Settings -> Power Management section

The L-5500 unit is designed to stay ON even if the ignition is turned OFF. You can configure your L-5500 unit to automatically shut down 15, 30, 60, 240, or 3600 minutes after ignition is turned off or when the supply voltage drops to a certain level.

Shutdown Method: Disabled by default (unit always ON after ignition is turned OFF). Select "Power Off" to enable power management.

After ignition line off: Select between the following time intervals: 15 minutes, 30 minutes, 60 minutes, 4 hours, or 24 hours.

When Voltage Drops to: Enter desired voltage. Enter "0" to disable. (Note: A value of 11V would be usually entered here as a precaution in order to ensure the vehicle battery does not drain.)

5.8. SNMP

SNMP is currently reserved for systems integrators. Contact Logic Data Systems for further support on this functionality.

5.9. GPS

The GPS page allows the user to see the GPS status and configure remote or local delivery of GPS position reports. Viewing the GPS data from a local or remote PC requires a UDP port listener program be installed on the PC. Any UDP listener will work provided you can set an appropriate port value for the program.

5.9.1. GPS Status

GPS	Status	AAVL Settings
Condition	Differential GPS Fix	
Number of Satellites	8	
UTC (hh:mm:ss)	07:36:34	
Position (Lat, Long)	33deg 46.40495min N, 117deg 51.80673min W	
Altitude (meters)	25.1	
True Course	0.0deg	
Ground Speed (Km/h)	0.0	

Figure 31 – GPS Status section

Condition: Indicates No Fix, Standard GPS Fix, Differential GPS Fix, or Estimated / Last Known Position

Number of Satellites: Indicates the number of satellites the GPS has locked on to. A minimum of 3 is required to establish a position. Generally, the more satellites the GPS has locked, the more accurate the position reporting will be.

UTC: Time of day in Universal Coordinated Time

Position: Device position reported in degrees and minutes

Altitude: Altitude from Mean Sea Level reported in meters.

True Course: Heading, reported in degrees (0 – 360)

Ground Speed: Reported in km/hr

5.9.2. AAVL Settings (Local and Remote Delivery)

GPS	Status	AAVL Settings						
Autonomous Automatic Vehicle Location Settings								
<table border="1"> <tr> <td>TAIP Vehicle ID</td> <td></td> </tr> <tr> <td>Differential Correction</td> <td><input checked="" type="radio"/> Enable <input type="radio"/> Disable</td> </tr> <tr> <td>Ignition Pinning</td> <td><input checked="" type="radio"/> Enable <input type="radio"/> Disable</td> </tr> </table>			TAIP Vehicle ID		Differential Correction	<input checked="" type="radio"/> Enable <input type="radio"/> Disable	Ignition Pinning	<input checked="" type="radio"/> Enable <input type="radio"/> Disable
TAIP Vehicle ID								
Differential Correction	<input checked="" type="radio"/> Enable <input type="radio"/> Disable							
Ignition Pinning	<input checked="" type="radio"/> Enable <input type="radio"/> Disable							
Local delivery								
TCP Server Format	TAIP, No ID <input type="button" value="on port 6257"/>							
UDP Host 1 Format	<input type="checkbox"/> PV <input type="checkbox"/> LN <input type="checkbox"/> TM							
UDP Host 1 Address	192	.168	.1	.255				
UDP Host 1 Port	21000 (0-65535)							
UDP Host 2 Format	disabled							
UDP Host 2 Address								
UDP Host 2 Port								
Remote delivery								
Report every	180 seconds							
Report every	10 meters							
But no less than	5 seconds between reports							
TCP Server Format	NMEA, GGA+VTG		<input type="button" value="on port 6258"/>					
UDP Host 1 Format	disabled							
UDP Host 1 Address								
UDP Host 1 Port								
UDP Host 2 Format	disabled							
UDP Host 2 Address								
UDP Host 2 Port								
UDP Host 3 Format	GPS Logic							
UDP Host 3 Address	70	.182	.140	.201				
UDP Host 3 Port	20500 (0-65535)							
<input type="button" value="Clear"/> <input type="button" value="Save"/>								

Figure 32 - GPS Local and Remote Delivery

TAIP Vehicle ID: User assigned number to identify the vehicle or L-5500 unit that each GPS report belongs to. This will be reported in the GPS messages if TAIP with ID is selected for TCP Server Format and/or UDP Host format. Configured under *Basic Settings* Page.

Differential Correction: Differential GPS corrects various inaccuracies in the GPS system to yield measurements accurate to a couple of meters when the mobile is moving and even better when stationary.

Ignition Pinning: When enabled, the vehicle's reported location becomes locked to the current position when the vehicle ignition is turned off. The reported vehicle location will not change until the ignition is turned back on, even if the vehicle moves. This feature is useful for overcoming the inherent drift issues found in GPS location data.

5.9.2.1. Local Delivery

The GPS data can be delivered to up to two local PCs with UDP viewer programs can provide data through a TCP connection, e.g. telnet. GPS data will be delivered once per second to all local PCs.

TCP Server Format: Select one of the following options for the format of the GPS messages

TAIP no ID: Trimble ASCII Interface Protocol, a Trimble specified digital communication interface. When this option is selected, the TAIP vehicle ID is not included in the GPS messages.

TAIP with ID: Same as above except the Vehicle ID is reported.

NMEA: National Marine Electronics Association interface specification for electronic equipment. The NMEA GPS message set includes several message types, each containing specific GPS information. See message descriptions below. TAIP Vehicle ID is not reported when NMEA is selected.

NMEA GLL: Position in LAT/LONG coordinates and time of day in UTC coordinates.

NMEA GGA: Position in LAT/LONG coordinates, time of day in UTC coordinates, fix quality, number of satellites and altitude.

NMEA RMC: Position in LAT/LONG coordinates, time of day in UTC coordinates, ground speed in knots, heading in degrees and date.

NMEA VTG: Ground speed in kilometers per hour and knots, heading in degrees.

UDP Host Format:

Disabled: Position reports are not sent on the local subnet.

TAIP, No ID: Trimble ASCII Interface Protocol without the ID field. When selected, several checked boxes will appear beneath the drop down to give an option for each TAIP sentence. Ensure at least one checkbox is selected.

TAIP with ID: Same as above except with the Vehicle ID reported.

NMEA: NMEA 0183 Protocol. When selected, a checkbox appears for selecting the following sentence formats: GLL, GGA, RMC, VTG.

UDP Host Address: IP address of local PC that GPS data will be delivered to. This address must be on the same subnet as the L-5500 LAN IP. To broadcast addresses across the entire subnet, enter the IP address in the form 192.168.1.255.

UDP Host Port: Port assigned to UDP program. This must match the port assigned in the chosen UDP Port Listener Program.

5.9.2.2. *Remote Delivery*

The GPS data can be delivered to up to three remote hosts.

Report every: GPS can be programmed to report position after a specified time has elapsed or the unit has moved a specified distance since its last report. This field indicates the maximum length of time or distance that can elapse between position reports.

But no less than: This feature prevents a fast moving vehicle from reporting too frequently if its "Report every meters" setting is sufficiently low by setting a minimum amount of time, in seconds, between GPS reports.

The remaining fields are the same as what's listed in Section 5.9.2.1.

5.9.3. *Sensor Reporting*

The L-5500 is capable of reporting the status of sensors when the Logic Data Systems protocol is configured under the remote reporting section of the AAVL Settings page. The Sensor Reporting page enables configuration of how sensor values are reported.

GPS	Status	AAVL Settings	Sensor Reporting	
GPS Logic AVL Reporting Configuration				
		Sensors Reported	2	▼
Sensor 1				
		Data Source	Battery Voltage(V)	▼
		Multiplier	1000	
		Offset	0	
		Minimum	0	
		Maximum	0	
Sensor 2				
		Data Source	Cellular Module Temperature (°C)	▼
		Multiplier	1.8	
		Offset	32	
		Minimum	0	
		Maximum	0	

Figure 33. Sensor Reporting

Sensors Reported: The number of sensors to be reported when a position report is transmitted. Changing this number hides or displays selection options for the available sensors.

Data Source: Sensor value for reporting to remote server (using Logic Data Systems protocol).

- **Battery Voltage (V):** The power supply voltage of the modem (also the vehicle's battery voltage when installed in a vehicle).
- **Cellular Module Temperature (°C):** Temperature of the cellular module in the modem.
- **Analog Input 1:** Voltage on the analog input #1 pin of the I/O port.
- **Analog Input 2:** Voltage on the analog input #2 pin of the I/O port.

Multiplier: Value to multiply the sensor reading before transmission. When a sensor value is read, it can be scaled and offset prior to transmission to allow for per-vehicle calibration adjustments.

Offset: Value by which a sensor reading should be adjusted after scaling by the multiplier. When a sensor is read, the value is first multiplied by the Multiplier, then added to by the Offset before being transmitted.

Minimum: When a sensor value drops below this parameter, a position report is immediately transmitted (regardless of time-distance formula).

Maximum: When a sensor value exceeds this parameter, a position report is immediately transmitted (regardless of time-distance formula).

5.10. Serial Port Settings

The following settings allow local or remote GPS reports to be sent out to the user COM port.

Port Settings	
Serial Port	
<input type="radio"/> Disable	
<input checked="" type="radio"/> GPS	
Report Trigger	<input checked="" type="radio"/> On Loss of Cellular Signal <input type="radio"/> Always
Reports	<input checked="" type="radio"/> Local (1 sec) <input type="radio"/> Remote (aav)
Baud rate	57600 (8,N,1)
<input checked="" type="radio"/> Garmin Messaging	
<input type="radio"/> Road Safety RS-3000	
<input type="radio"/> Serial Over TCP/UDP	
Baud rate	115200
Idle Disconnect Timeout	0 (0-65535) sec
Remote Host	0 . 0 . 0 . 0
Port	5000 (0-65535)
Control Port (TCP Only)	5001 (0-65535)
Pad Mode	tcp

Figure 34 – Serial Port Settings

5.10.1. Serial Port

5.10.1.1. GPS Configuration

The serial port settings are disabled by default. To enable GPS reports to be sent out to the user COM port, select "GPS". The GPS reports could be sent over the serial port "Always" or only "On Loss of Cellular Signal".

Note that the following delays apply if the latter is selected:

On power-up: Reports are delayed for 90 seconds to allow time for cellular connectivity to be established.

During Operation: Reports are delayed for 30 seconds after loss of cellular connectivity is detected.

Select “Local (1 sec)” if every GPS report is required or “Remote (aavl)” for GPS reports to be sent out based on the AAVL settings (see AAVL settings).

Note: GPS Report format is set in the “TCP Server Format” pick lists on the GPS web page.

5.10.1.2. *Garmin Messaging*

Enables transfer of navigation and messaging functions to an attached Garmin navigation device for automated dispatch and messaging. Requires subscription to Logic Data Systems Fleet Management System.

5.10.1.3. *Road Safety RS-3000*

Allows transmission of Road Safety data using the cellular data network. When selected, ensure the L-5500 COM port is connected to COM3 or COM4 on the RS-3000 black box using a straight through serial DB9M to DB9F cable.

NOTE: When using the L-5500 in conjunction with the Road Safety RS-3000, a static IP address is highly recommended.

5.10.1.4. *Serial Over TCP/UDP*

Enables the L-5500 to act as a remote virtual serial port for communicating with PCs using TCP.

Baud rate: Baud rate of connected serial device.

Idle Disconnect Timeout: When no traffic has been sent or received during this period, the socket is closed and reset to allow subsequent connections to be established.

Remote Host: Remote destination of where packets are transmitted.

Port: Local TCP port to listen for client connections.

Control Port (TCP Only): TCP Port used for control and monitoring of the serial port by the remote application.

Pad Mode: Currently always set to tcp.

5.11. I/O Settings

The L-5500 supports the following I/Os:

- L-5500 Input Status: Ignition sense, main voltage, and modem temperature
- Two general purpose external analog input lines (AIN1, AIN2)
- Two general purpose external digital input lines (DIN1, DIN2)
- Two general purpose external digital outputs (relay-driven contact closures). Implemented as two sets of SPST contacts (normally open) (NO1a ... NO2b)

See Figure 35 for pin output diagram.

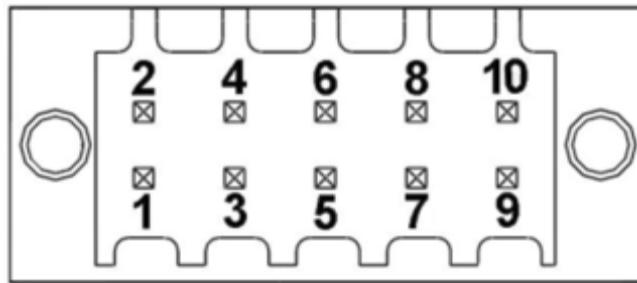


Figure 35 - L-5500 Pin-output. View looking into device.

Digital inputs are internally biased high. To trigger a digital input, connect the pin to ground.

When digital outputs are triggered, the **a** and **b** pins are connected via an internal relay. The internal relays are rated for 1A @ 30V, or .3A @ 125VAC.

Pin #	Description	Notes
Pin 1	Digital Output 1a (NO1a)	Normally open terminal a of Relay #1
Pin 2	Digital Output 1b (NO1b)	Normally open terminal b of Relay #1
Pin 3	Digital Output 2a (NO2a)	Normally open terminal a of Relay #2
Pin 4	Digital Output 2b (NO2b)	Normally open terminal b of Relay #2
Pin 5	Digital Input 1 (DIN1)	Active when connected to ground.
Pin 6	Digital Input 2 (DIN2)	Active when connected to ground.
Pin 7	Analog Ground	Connect to negative or ground side of analog sensor.

Pin 8	Digital Ground	
Pin 9	Analog Input 1 (AIN1)	
Pin 10	Analog Input 2 (AIN2)	

5.11.1. I/O Signal Specifications

The following values are acceptable ranges for digital inputs and outputs:

Input Type	Label	Specification
Analog Input	AIN1, AIN2	Input voltage: 0 to +30V
Digital Input	DIN1, DIN2	Schmitt-trigger inputs: Positive threshold: 2.3V max Negative threshold: 0.7V min Maximum input: 5.5V
Digital Output	NO1a ... NO2b	Nominal switching capacity (resistive load): 1A, 30VDC 0.3A, 125VAC

The default power up state for the digital outputs is normally open (**a** and **b** pins disconnected).

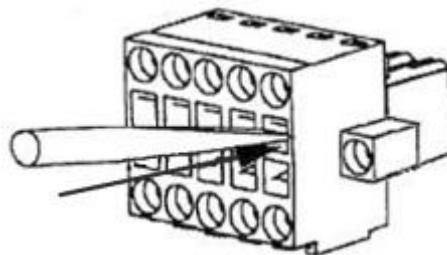
5.11.2. Debouncing

All analog and digital input signals are debounced for 500ms. Thus pins must maintain the same input condition for 500ms continuously before the pin state is changed.

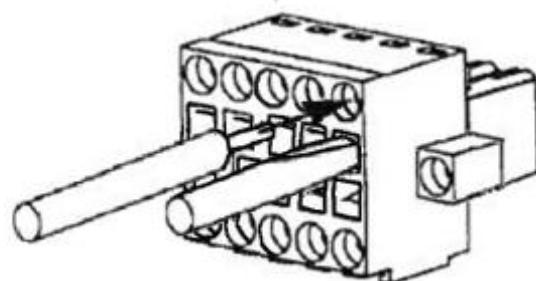
5.11.3. Inserting Wires Into I/O Port Connector

For ease of installation, the L-5500 includes an I/O Port Connector for simple connection of I/O wires to the modem. The following instructions outline use of the I/O Port Connector.

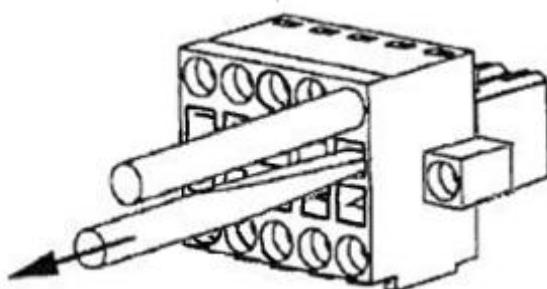
1. Insert 2.5 mm insertion tool or flat head screw driver into the wire release slot. Do not twist tool.



2. Keep the insertion tool in place, insert wire (28 AWG minimum, 18 AWG maximum) into the wire hole.



3. Remove the insertion tool. Check wire connection.



5.11.4. I/O Configuration

The L-5500 I/O subsystem is configured via the L-5500 web pages. Status monitoring is provided either by the Logic Data Systems Fleet Management System using the LM Direct protocol, or by an NMEA-based protocol. The L-5500 I/O subsystem operates according to a manager/agent module. The PC-hosted manager sends requests to the L-5500 I/O agent, which performs the required actions. The L-5500 agent reports alarms and indications to the PC-hosted manager.

5.12. System Upgrade

Logic Data Systems periodically releases firmware updates for bug fixes and enhanced functionality. Typically firmware is automatically managed by the Logic Data Systems modem maintenance server.

Customers also have the option of manually updating devices by uploading a firmware file using a locally attached PC. To initiate a local firmware update, click the browse button to select the Logic Data Systems firmware update file. Click the Save button to begin the upgrade process. When the update is complete, the L-5500 will automatically restart.

5.12.1. Configuration File

The L-5500 configuration can be saved and uploaded into multiple units allowing customers to create and save a master configuration file for deployment to multiple devices.

To save the configuration for the current modem, select the Save Config button.

Conversely, a configuration file can be uploaded into the device by selecting the Browse button corresponding to the Upload File field. Once the config.tar.gz file is selected, click the Upload button to apply the new settings.

Warning: Do not attempt to perform a modem update from a remote connection.

6. Carrier Specific Information

Each cellular provider uses a different PRI file that needs to be programmed into the modem for the modem to register properly on their cellular network and connect. These PRI files are typically programmed into the modem by the manufacturer of the RF module. The following sections list different carriers and the requirements for activating modems on their networks. Cellular providers will (where applicable) supply username and password formats for making EVDO calls. Logic Data Systems modems support the service provisioning features called Over-the-Air Service Provisioning (OTASP) and Over-the-Air Parameter Administration (OTAPA). OTASP occurs when a user initiates a call to the service provider. No further commands are (typically) required to provision the modem. For example, a user with a new modem/phone without service programming data can call the service provider's special OTASP number to have the device programmed without physically taking it to the service provider. OTAPA occurs when the network initiates a call to the modem and programs it without any user intervention. OTAPA is typically used when the service provider decides to update information on many cellular devices at the same time.

NOTE: L-5500 radio modems are carrier specific, you must specify the carrier you will be using when ordering. A unit purchased for one carrier cannot be activated on any other carrier.

Generally, you will not be able to provision a device if you are not in your home network area. You will also need to make sure that you have sufficient signal strength to perform provisioning.

6.1. Verizon Wireless

Before starting the OTA process, ensure that you have a strong enough signal for cellular communication.

When you activate a contract with Verizon, Verizon will assign a 10 digit MDN/MIN number to your module's ESN. When this is done, you are ready to OTA the module. Verizon activation is done by submitting an OTA command of *22899 to the Verizon network. This command is entered by default into the OTA command box on the "WAN Cellular Page". It should not be necessary to modify this command, simply select OTASP, click "Submit" and allow the activation to complete. This process may take several minutes. This command is also used to update the PRL file. When the OTA is complete, the MDN provided by Verizon should be displayed on the home page.

6.2. Bell Mobility

Activation on the Bell mobility network requires manual entry of the MDN, MIN and Unlock code. Bell will provide these numbers when you initiate your data contract with them. In most cases, the MDN and MIN will be the same number. On the WAN Cellular page, enter the MDN, MIN and Unlock code and click "Submit". The activation process will occur

automatically once the parameters are entered. This process may take a few minutes and you may need to reset the device to have full network access.

6.3. Sprint PCS

6.3.1. IOTA Provisioning

The 3GPD parameters are easily configured using Over The Air Provisioning. Sprint PCS uses IOTA (IP-based Over The Air) for their OTA provisioning system. IOTA uses packet data calls to transfer the configuration data to the modem. These IOTA data sessions can be network initiated or Client initiated. Network Initiated IOTA is the preferred method. An automatic network initiated IOTA session occurs when the module first registers onto the Sprint network. This IOTA session is queued when Sprint originally sets up and 'activates' the account. In their current implementation, Sprint imposes a 72 hour expiration timer for this queued IOTA session. An IOTA session has a device time out of 15 minutes. If unsuccessful after 15 minutes, the status changes to fail and the module stops trying. A normal IOTA session takes from 1 to 3 minutes. To register on the network, the module needs a sufficient signal and requires manual provisioning with the MDN and MSID. The IOTA session will occur and populate the 3GPD parameters. If it is the first IOTA session, it is called a Network Initiated Initial Provisioning (NIIP.)

NOTE: An IOTA session MUST occur while the device has sufficient signal and is registered on the Sprint PCS Network. A session will not be successful if the device is out of coverage or not properly registered on the Sprint PCS network.

7. Service and Support

7.1. Product Warranty, RMA and Contact Information

Logic Data Systems LLC guarantees that every L-5500 Cellular Modem will be free from physical defects in material and workmanship for one (1) year from the date of purchase when used within the limits set forth in the Specifications section of this manual. Extended warranty plans are available.

If the product proves defective during the warranty period, contact Logic Data Systems Customer Service to obtain a Return Material Authorization (RMA).

7.2. RMA Request

Contact Customer Service:

Logic Data Systems LLC
23461 South Pointe Dr, Suite 115
Laguna Hills, CA 92653

Phone: (949) 892-5263

BE SURE TO HAVE THE EQUIPMENT MODEL AND SERIAL NUMBER, AND BILLING AND SHIPPING ADDRESSES ON HAND WHEN CALLING.

When returning a product, mark the RMA clearly on the outside of the package. Include a complete description of the problem and the name and telephone number of a contact person. RETURN REQUESTS WILL NOT BE PROCESSED WITHOUT THIS INFORMATION.

For units in warranty, customers are responsible for shipping charges to Logic Data Systems LLC. For units returned out of warranty, customers are responsible for all shipping charges. Return shipping instructions are the responsibility of the customer.

7.3. Product Documentation

Logic Data Systems LLC reserves the right to update its products, software, or documentation without obligation to notify any individual or entity. Product updates may result in differences between the information provided in this manual and the product shipped. For the most current product documentation, visit www.logicdatasystems.net for spec sheets.

7.4. Technical Support

Technical support hours: Monday to Friday 9:00 AM to 5:00 PM, Pacific Time

Logic Data Systems LLC, 23461 South Pointe Dr, Suite 115, Laguna Hills, CA 92653

Phone: 949.892.5263
support@logicdatasystems.net

8. Appendix A – Road Safety Integration

The L-5500 Cellular Data Router may be configured to integrate with ZOLL’s Road Safety¹ system for real-time transmission of vehicle data to the Road Safety base station using the cellular connection.

In addition to providing remote access in real-time to all Road Safety equipped vehicles, the L-5500 allows use of IPSec for encrypting the data connection between the Road Safety base station and the vehicle.

8.1. Prerequisites

To ensure a reliable connection between Road Safety and the L-5500, Logic Data Systems strongly recommends adherence to the following prerequisites.

- Activated cellular data plan (highly recommend unlimited or 5GB monthly data plan per vehicle).
- Static publicly addressable IP address, or a configured IPSec tunnel with unique private subnet for each L-5500.

NOTE: Additional prerequisites may be required by Road Safety. Please contact your ZOLL Data representative for more information.

8.2. Configuration

For each vehicle to be configured with the L-5500 and Road Safety, the following steps must be completed.

- Physical Connection
- L-5500 Serial Port Configuration
- Road Safety Base Station Configuration

8.2.1. Physical Connection

To connect the L-5500 with Road Safety’s RS-3000 vehicle computer, connect the COM port on the L-5500 to COM3 or COM4 on the RS-3000 using a straight through DB-9M to DB-9F serial cable.

¹ For additional information on the RescueNet Road Safety system by ZOLL, visit <http://www.zolldata.com>.

8.2.2. L-5500 Serial Port Configuration

Log into the L-5500's web interface (see Section 4) and select the *Serial Port Settings* page.

Under the *Serial Port* section, select the **Road Safety RS-3000** option and click Save:

Serial Port	
<input type="radio"/> Disable	
<input checked="" type="radio"/> GPS	
Report Trigger	<input checked="" type="radio"/> On Loss of Cellular Signal <input type="radio"/> Always
Reports	<input checked="" type="radio"/> Local (1 sec) <input type="radio"/> Remote (aav)
Baud rate	57600 <input type="button" value="▼"/> (8,N,1)
<input type="radio"/> Garmin Messaging	
<input checked="" type="radio"/> Road Safety RS-3000	
<input type="radio"/> Serial Over TCP/UDP	
Baud rate	115200 <input type="button" value="▼"/>
Inter Character Timeout	50 <input type="text"/> (1-65535) ms
DTR	Ignore <input type="button" value="▼"/>
RTS	Ignore <input type="button" value="▼"/>
DSR	Always Off <input type="button" value="▼"/>
CTS	Always Off <input type="button" value="▼"/>
DCD	Connect On <input type="button" value="▼"/>
RI	Always Off <input type="button" value="▼"/>
Periodic Reset Timeout	0 <input type="text"/> (0-65535) mins
Id	abc <input type="text"/>

Figure 36. L-5500 configuration for use with the Road Safety RS-3000.

8.2.3. Road Safety Base Station Configuration

To complete the installation, further configuration must be performed on the Road Safety base station. For instructions, please contact your ZOLL Data representative.